

A LONG-TERM DUNE MANAGEMENT PLAN:

OLD ORCHARD BEACH

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A LONG-TERM SAND DUNE MANAGEMENT PLAN
FOR THE
OLD ORCHARD BEACH COASTAL DUNE SYSTEM,
OLD ORCHARD BEACH, MAINE

Prepared For:

The Town of Old Orchard Beach
Old Orchard Beach, Maine 04064

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1.0 INTRODUCTION

The Town of Old Orchard Beach is the northern-most coastal community within York County. By virtue of its position along the mid-point of the shoreline of Saco Bay, its entire coastal shoreline constitutes one of the longest (3.1 miles) and widest (500 feet at low water) sand beach systems in Maine (Figure 1).

Because of its proximity and easy highway access to the major metropolitan areas of the northeast U.S. and eastern Canada, Old Orchard Beach enjoys a brisk seasonal tourism which is centered on, primarily, the beach system. Consequently, much of the historical development of the town has been focused on the beach and supporting environments adjacent to the beach. Hotels, motels, entertainment establishments, restaurants, stores and amusement centers have all been developed within a short distance of the beach to accommodate the tourist trade. Concomitantly, municipal services required to support this development have been developed on and adjacent to the beach system and, of necessity, require periodic upgrading to keep up with growth within the community.

In November, 1985, the Maine Board of Environmental Protection granted various environmental permits to the Town of Old Orchard Beach in order for the Town to upgrade the existing capacity of their municipal sewerage treatment system. Included among these permits was a sand dune permit to construct and upgrade an existing sewer line located beneath the backbeach and backdune area of Old Orchard Beach.

Among others, the sand dune permit stipulated two conditions to the granting of the permit with respect to maintenance of the sand dune environment. The first condition stipulated a short-term mitigation plan to prevent any construction damage to the section of dunes within which the pipeline construction was to occur and upgrade dune protection of the same dune area. The second condition, suggested by the Town of Old Orchard Beach, stipulated that the Town would conduct a long-term dune management study for the entire Old Orchard Beach dune system and present that study to the Department of Environmental Protection on or before September 1, 1986 (Appendix I).

In April of 1986, the Town of Old Orchard Beach contracted with E.C. Jordan Company to design and monitor the pipeline construction activity within the sand dune area. E.C. Jordan Company, in turn, sub-contracted with Earth Surface Research, Inc. to conduct short-term

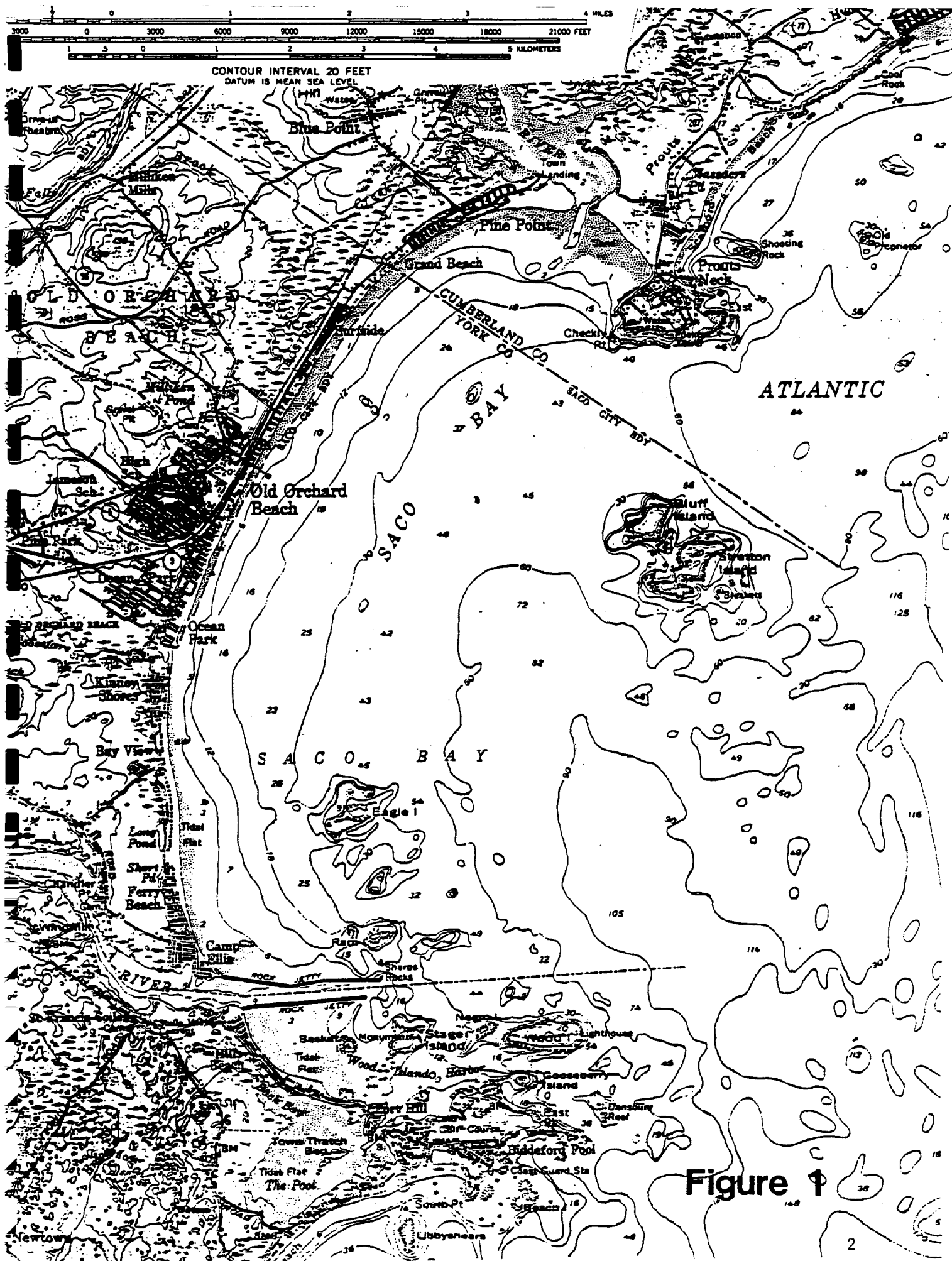


Figure 1

environmental monitoring of the pipeline construction within the sand dunes and prepare a long-term sand dune management plan to satisfy the conditions of the Dept. of Environmental Protection's sand dune permit.

This report constitutes the long-term dune management plan requested by the Maine Board of Environmental Protection and the Town of Old Orchard Beach as a condition of the sand dune permit issued in December of 1985.

It is not the intent of this study to review or analyze the past geologic history or future of the Old Orchard Beach barrier system. Long-term dune management, if based upon sound geologic principles and accurate observations, will improve the dunes at Old Orchard Beach no matter how future coastal processes influence the shape or position of the Old Orchard Beach barrier system. If the reader is interested in understanding the recent geologic past of the Saco Bay system, he or she are referred to the works of Farrell (1970 and 1972); Nelson (1979); Moreau et. al.(1981); and Larson et. al. (1984).

It is also not the intent of this plan to review recommended techniques for planting and/or managing newly created dunes. The reader is referred to the plan of Moreau et. al. for an adequate treatment of that subject matter.

1.1 Acknowledgements

The authors gratefully acknowledge the advice and consultation with the following individuals who contributed their time and knowledge toward the successful completion of this management study:

Jerome Plante, Town Manager of Old Orchard Beach; James Fitch and Dean Marriott, E.C. Jordan Company; George Ouellete, Old Orchard Beach Chamber of Commerce; the Members of the Old Orchard Beach Town Council; Dow and Coulombe Surveyors; Geoffrey Hole and Catherine O'Connor, the law firm of Bernstein, Shur, Sawyer and Nelson; and David Studer, Maine Department of Environmental Protection.

This study was funded by the Town of Old Orchard Beach. During the course of this study, the authors effort was met with enthusiasm by property owners, businesses, and town officials. Any project becomes much more satisfying when, during its development, there is a clear indication that the client supports your efforts and will attempt to utilize the

work which the consultant has done. Our thanks to the citizenry and officials of the Town of Old Orchard Beach.

The authors also wish to thank Francis Danton, proprietress of a local restaurant, for her example of hard work, spirit, and hope. Visits to her restaurant were the highlight of our morning coffee break while conducting on-site field work for this study.

1.2 Objectives of the Management Plan

The overall goals of the longterm sand dune management plan for the Old Orchard Beach dune system are:

- Provide a critique of the initial sand dune management plan of 1979 and assess the successes or failures of the management program since 1979.
- Review the existing condition of the sand dunes and assess their ability to provide adequate sand storage and coastal storm flood protection in light of recent flood insurance study data.
- Provide recommendations to the Town of Old Orchard Beach to effect a long-term (10-year) management plan to increase the capacity of the dune system to provide for sand storage, coastal storm flood protection, and increased aesthetic recreational value.

The effort of the management plan is restricted to the active portions of the sand dune system which front the existing development along the length of the beach. For all intensive purposes the management plan is restricted to those portions of the beach seaward of the existing seawalls, but includes naturally-vegetated portions of the sand dune which have developed on and behind some seawalls along certain portions of the beach system (Figure 2).

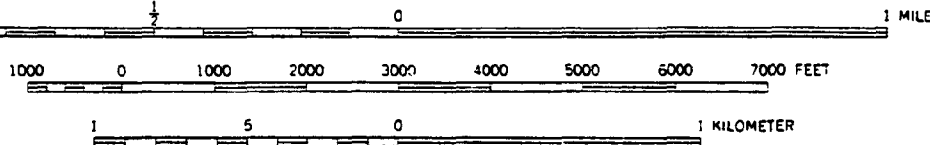
1.3 Methodology

In order to meet the stated objectives of the long-term management plan, Earth Surface Research, Inc. undertook several tasks. Those tasks were:

1. a review the 1979 management plan entitled, "A Study of Beach Processes and Management Alternatives for Saco Bay" authored by Marcel Moreau et. al.;

Figure 2: Map of Old Orchard Beach with
outlines of beach segments
described in detail within
Section 5.

SCALE 1:24000



CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

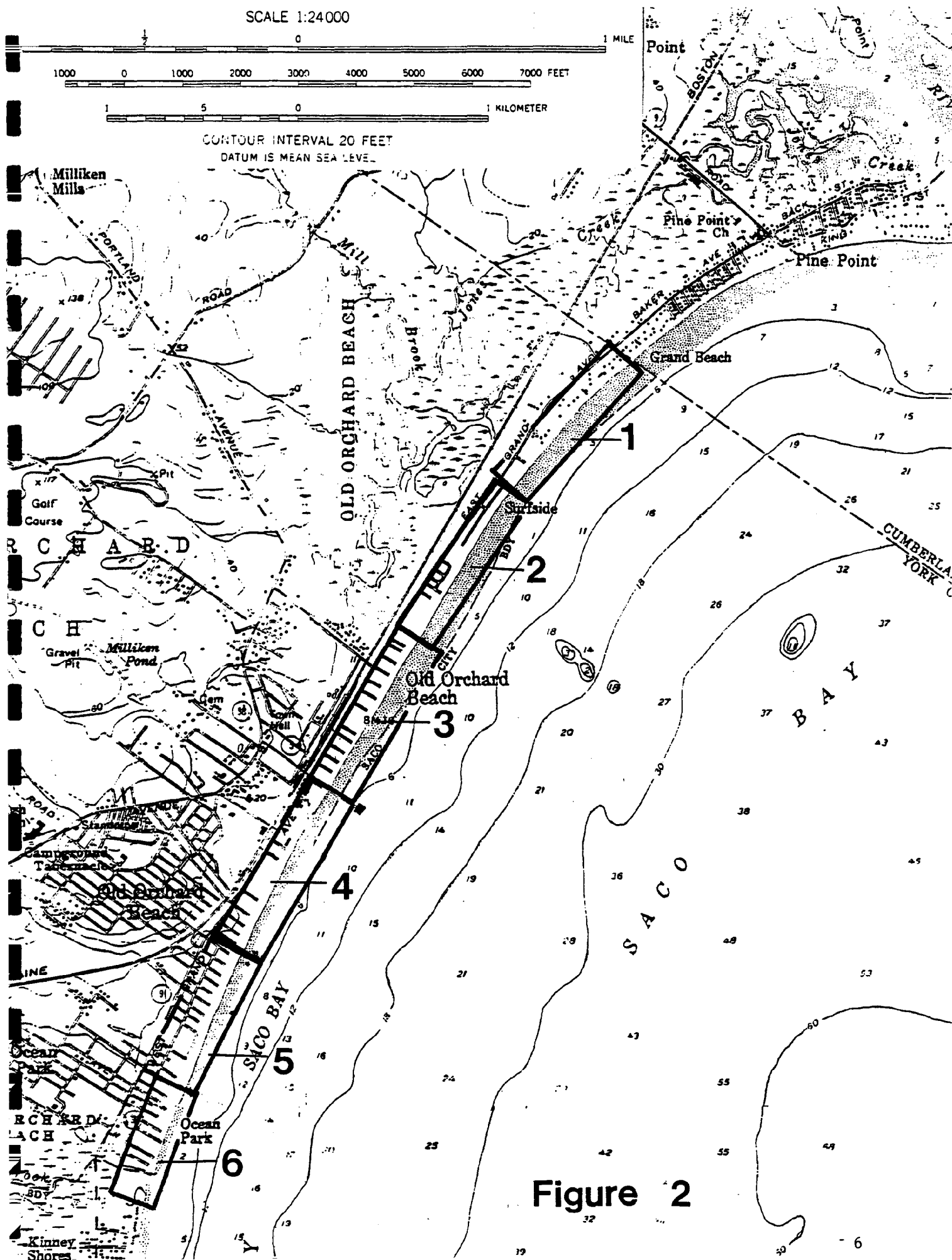


Figure 2

2. a review the existing dune protection ordinance of the Town of Old Orchard Beach and conducted observations over several weeks time during the height of the tourist season to determine if the ordinance was being adhered to;
3. a review the existing Federal Emergency Management Agency's Flood Insurance Rate Map for Old Orchard Beach dated July 5, 1984;
4. inspection of the entire sand dune tract from Goosefare Brook to the Scarborough Town line. The inspection included observations of existing dune height and width; potential for dune expansion and/or heightening by natural or artificial means; existence, condition, and height of seawalls; general recreational use levels of the beach fronting the dunes; and the general use and development patterns landward of the dunes;
5. flew an aerial photographic flight of the dune, beach, and developed portions of the dune system to assist in the evaluation of the dune system and compare the extent of the dunes to historical aerial photographs;
6. interviewed the Old Orchard Beach Chamber of Commerce and town officials concerning the goals of the long-term management plan;
7. held a public hearing at an Old Orchard Beach Town Council meeting (August 19) to solicit views of the council and citizenry concerning preliminary recommendations of the management plan.

2.0 THE 1979 DUNE MANAGEMENT PLAN

In 1979, a group of graduate and undergraduate students from selected colleges in New England undertook a management alternative study of the entire Saco Bay dune and beach system. The study was conducted under the auspices of the the Southern Maine Regional Planning Commission and funded by a Coastal Zone Management Grant through the Maine State Planning Office.

The plan consisted of a number of separate narratives of the geologic history of the beaches from Camp Ellis to the Scarborough River Inlet, beach erosion, effects of development and sea walls on the health of the beach under rising sea level conditions, and sources of sand for the beach system. Included were sections on how to manage a sand dune and a review with general recommendations on improving the sand dunes along Old Orchard Beach, breaking the beach and dunes down into three distinct management zones.

2.1 Summary of the 1979 Plan for Old Orchard Beach

Zone 1: Goosefare Brook to Tunis Avenue

This zone includes an area of narrow dunes fronting six dwellings with a new cement seawall and an extensive, wide dune field in front of the Ocean Park section of Old Orchard. The 1979 provided no recommendations for the section of dunes fronting the six houses. The plan recommended that the dunes fronting the Ocean Park section be protected by erecting and maintaining snowfencing, elevated boardwalks, and allowing the front vegetation of the dunes to migrate further seaward to their natural position.

Zone 2: Tunis Avenue to Old Orchard Beach Pier

This section of the beach received little specific direction for the future in the 1979 plan other than to create and protect sand dunes with fencing and elevated boardwalks. The plan urged that dunes be created and protected from the Brunswick Hotel to the Pier, an area devoid of dunes with the cessation of the practice of

bulldozing the sand from washover onto parking and street areas to the frontal beach.

Zone 3: Old Orchard Beach Pier to the Scarborough Line

The 1979 plan recommended that dunes be established along this section of the beach by planting "islands" of dune 10' long at regular intervals of 100'. With the addition of fencing over a ten-year period, areas between these planted sections would fill in naturally to establish a continuous frontal dune in front of the seawalls. The plan recommended that a Grand Beach Association be formed by the local residents to assist the Town in establishing the dunes along this section.

General Recommendations of the 1979 Plan

In many respects, the 1979 Dune Management Plan was written to assist the Town of Old Orchard Beach in managing newly created and planted dunes which was undertaken in early 1979 in response to the flood damage caused by the February 1978 coastal storm -- the equivalent to a 100-year storm flood. As well as providing for specific directions in managing certain areas, the plan included a general section on dune management.

A large part of the general recommendations dealt with the planting and establishment of new dune grass, but also stressed the need for narrow boardwalks, particularly, if money was available, the establishment of elevated boardwalks over the dunes from existing public right-of-ways to the beach.

Of importance, the plan stressed the need for continued protection of the established dunes from foot-traffic, and urged continual maintenance of the snow-fencing around the newly planted dunes. Of note, the plan calls for the removal of the fencing along the seaward edge of the dunes during the winter months. The removal is necessary to allow for the natural wind transport of sand up into the dunes.

2.2 Accomplishments of the 1979 Dune Management Plan

The Old Orchard Beach dune planting program and following dune management plan accomplished a very noteworthy goal. It more than doubled the vegetated dune surface behind the beach and seaward of the seawalls from its area viewed from 1975 aerial photographs taken of the entire town by James W. Sewall, Company.

Observations during the summer months of 1986 indicate that the Old Orchard Beach dune protection ordinance, enacted in 1979 and prohibiting foot-traffic within any dune area and levying a fine of \$100 for violations, has been very effective in preventing foot-traffic behind any maintained snow-fencing. During twenty different days when observations were made of the dune area and monitoring of the pipeline construction was undertaken, only two individuals were seen behind the fencing in the Ocean Park area. These two individuals were retrieving a kite which had downed behind the foredune ridge.

Despite the fact that thousands of people use the beach each day during the height of the tourist season, established dunes protected by fencing remain relatively healthy. Local residents and tourists appear to be sensitive to the fact that the dune area is important without any warning signs required. Local residents in the Grand Beach area of Old Orchard Beach even have maintained full-width dunes without fencing -- these areas have minimal foot-traffic even during the height of the tourist season. However, where motels of multiple-unit housing occurs right behind the dunes without fencing, unrestricted foot-traffic has prevented the establishment of natural grass.

Specifically, the 1979 dune management plan offered sound, general advice on the establishment and maintenance of dunes, and recognized that the existing dunes could be expanded by extending fencing to adjacent areas currently without dunes. Further, it recognized that frontal fencing had to be removed seasonally in order for the natural transport of sand to occur during the winter months to allow the dunes to build naturally.

The initial planting and management effort was successful in educating the Town and shorefront owners to the value of dunes and provided them with the basic understanding on how to manage them.

2.3 Deficiencies of the 1979 Plan

The 1979 plan, while providing a successful basis for the initial management and expansion of the dunes, was written without the availability of specific flood hazard information. Since then, specific flood information has become available for the entire length of Old Orchard Beach, and provides a basis for measuring the existing dunes capability of mitigating storm flooding as well as providing a logical basis for prioritizing sections of the beach,

presently unvegetated, for artificial dune construction efforts to minimize future storm damage.

The underlying philosophy of the plan was to establish dunes along the entire length of Old Orchard Beach. It did not attempt to balance the dune establishment effort with the levels of use in each section of the beach. Perhaps it shouldn't have in order to force the initial success of the dunes. However, after several years since the initial plan, observations on the beach indicate that the success of any dune establishment or maintenance program is critically linked to the demand for beach recreation in any particular location.

Finally, the plan recommended, in all cases, that elevated boardwalks be constructed in all rights-of-way. While a noble endeavor, on paper, elevated boardwalks present several problems. First, fixed structures constructed in potential "V" flood zones and "A" flood zones are susceptible to wave damage and may create a flood hazard themselves by allowing lumber debris to become wave-borne and thrown into developed areas landward of the dunes. Also, fixed, elevated boardwalks are expensive to maintain and, if not adequately planned, may need to be constructed as the dune grow beneath them. Finally, elevated boardwalks present a possible liability hazard to the community in the event of a serious accident falling from the elevated boardwalk surface. Economic, flood hazard, and insurance considerations lead to the conclusion that fixed, elevated boardwalk structures are not the most feasible solution to directing foot-traffic over the dune area.

3.0 THE COASTAL STORM FLOOD HAZARD

In 1984, the Town of Old Orchard Beach adopted the National Flood Insurance program and accepted the Federal Emergency Management Agency's Flood Insurance Rate Maps (FIRM) as the base conditions for the flood hazard areas during a 100-year storm. The flood maps were constructed utilizing information from theoretical studies of storm surges and wave heights generated from a "synthetic" 100-year storm, but augmented with claim information submitted by shorefront property owners for damages occurring during the February 8, 1978 Northeast storm. This storm is widely accepted by experts as being equivalent to a 100-year storm.

During a 100-year storm, the beach, dunes and seawalls at Old Orchard will experience storm wave heights ranging from 3' to 6' feet in height generated on a storm surge sea level of 9' above NGVD (National Geodetic Vertical Datum) (approximately equivalent to mean sea level). Shorefront areas subjected to wave heights of 3' or greater lie in a high hazard zone where forward wave propagation velocities are capable of causing structural damage and rapid beach and dune erosion. Areas subjected to wave heights of 3' or less lie in a zone of flooding without significant structural damage; but, nonetheless, will experience erosion if waves act on the sand and vegetation of dune areas. Respectively, these areas are referred to as "V-Zones" and "A-Zones".

Along Old Orchard Beach, "V-Zones" occur right up to existing dune ridges or seawalls, and areas at the end of existing roads and right-of-ways or immediately behind seawalls will experience flood conditions typical of "A-Zones". "A-Zones" are not mapped along the Old Orchard Beach shorefront on the FIRM maps because they impact relatively small areas with respect to the scale of the maps (1" = 400').

Poorly constructed seawalls lying within "V-Zones" may be damaged by storm waves, fail, and allow "V-Zone" flooding conditions to migrate to structures and areas behind the failed seawalls. Knowledge of flood conditions, seawall heights and integrity, and the vertical and horizontal extent of any dunes seaward of the developed areas of Old

Orchard Beach is important to predict future storm damage susceptibility.

Vegetated sand dune areas lying within "V-Zones" undergo extensive erosion by wave energy. The amount of erosion depends on the wave energy impacting the dunes (directly related to wave height), the height and width of the dunes, and the duration which the wave energy acts on the dunes. The higher and wider the sand dune field fronting developed areas, the more protection the sand dunes provide for seawalls and structures lying behind the seawalls or directly behind the dunes.

In order to determine the potential flood hazard along a given section of Old Orchard Beach, field observations were made of the extent of the existing dunes (or lack of dunes); the structural integrity and height of any seawalls was estimated; and the flood elevations (from the FIRM maps) within sections of similar overall characteristics. These data were correlated to rate any given section of the beach as to the real flood hazard potential which could exist during a 100-year storm.

3.1 The Role of Dunes in Reducing the Flood Hazard

The 1979 dune management study adequately addressed the importance of coastal dunes to preventing coastal storm damage to developed areas. High, wide and healthy frontal dunes:

- Provide a physical barrier to coastal storm waves from penetrating developed areas behind them.
- Absorb wave energy by eroding.
- Provide a reservoir of sand to replace sand eroded from the frontal beach by the storm waves, thus maintaining a relatively wide beach over and on which storm waves must expend energy before striking other dunes, seawalls, or shorefront structures.
- Reform, at no cost, between severe coastal storms to again provide a barrier against destructive waves from future storms.

By nurturing and maintaining an effective sand dune field between the beach and developed portions of the shorefront, a community, individual, or business minimizes the chances for coastal storm damage and costly repairs to

business and dwelling structures as well as to seawalls themselves.

Regardless of the existence of the federal flood insurance program, property owners may reduce their flood insurance premiums by promoting and maintaining healthy dunes. This is especially desired because flood insurance rates will soon become actuarial (based on the real risk of damage and not subsidized by inland federal taxpayers)(Fred Michaud, 1986).

4.0 GENERAL CONDITION OF THE OLD ORCHARD BEACH DUNES AND EXISTING MAINTENANCE PROGRAM

4.1 General Dune Conditions

4.1.1 Ocean Park Section

While the dune planting and management effort since 1979 has doubled the areal extent of the dune field fronting Old Orchard beach over that of their condition a decade ago, observations of the health, height, and width of the existing dunes and lack of dunes along some sections indicate that further efforts are required to promote the expansion of the existing dunes and to construct or create new dunes along certain areas of Old Orchard Beach which are devoid of vegetated dunes.

While a later section of this plan contains site-specific recommendations for dune expansion or creation, a general discussion of the existing dune conditions will help focus attention on the present overall capability of the dunes to be improved upon.

Presently, sand dunes exist continuously from the inlet of Goosefare Brook (the southern Old Orchard Beach town boundary with Saco) to 4th Avenue, a distance just less than one mile. This area was the area of major dune planting and management effort in 1979 and has remained fenced since then. With the exception of the very southerly end, the dune field is relatively wide, high and exhibits healthy, active vegetation along the frontal dune ridge.

Observations of the existence of colonizing dune vegetation seaward of the frontal fence protecting the dunes and low, unvegetated embayments at the heads of boardwalks indicate that these dunes can be widened and low areas filled in to further widen the existing dune field.

Further, the grass vegetation (American beach grass) behind the frontal dune ridges exhibits unhealthy characteristics typical of old-aged, mature beach grass. While this grass still densely populates the dune, there are large areas of dead grass stems. It is apparent that these areas, characterized by unhealthy grass, are not

receiving sufficient wind-transported sand to maintain vigorous growth patterns.

Many right-of-way pathways are 2' to 3' below the adjacent dune ridge grade. These pathways, although covered with boardwalks, allow wave washover and wind transported sand to be deposited at the street end of the boardwalks, often necessitating removal by town highway personnel. In some locations, this sand is washed into the storm and septic sewer system manholes and requires periodic removal.

4.1.2 Old Orchard Pier Section

The section of Old Orchard Beach centered on the pier and amusement area presently lacks any dune vegetation. Foot access to the beach area throughout this section is uncontrolled and uncontrollable because of the nature and intense recreational use to which the adjacent landward developed area is subjected. Paved areas without seawalls projecting more than 1 foot above the beach surface commonly are covered with windblown and washover sand. This sand is periodically removed by individuals and town personnel and placed back on the beach or utilized in an unknown manner.

100-year flood elevations along this central beach section range from 12' south of the pier to 14' north of the pier. The amusement park area south of the pier is well protected from storm waves by a substantial seawall and most of the park area is open, paved surface. North of the pier, most structures are close to the beach, but protected by high, well-built seawalls. The potential flood damage to this area is relatively low compared to other sections of the beach north of this section.

4.1.3 The Southern End of Grand Beach

The southern end of the Grand Beach section of Old Orchard Beach is a shoreline segment where several isolated dune areas exist separated by backbeach areas without dunes. The isolated dune sections exist because private landowners have made a concerted effort to protect dune areas in front of their lots with snow-fencing, or the dunes exist in areas where the lots behind the dunes are occupied by single-family owners who present little foot-traffic pressure on the beach area directly in front of their lots.

Observations of the use levels of this section of the beach, even during the height of the tourist season, indicate that a continuous dune field could be established along the entire length of the beach, but establishment of such a dune field will have to be carefully planned and

maintained because of very high recreation pressure and uncontrolled access to the beach from multiple-unit motel and hotel facilities backing the beach.

Some shorefront lots along certain stretches of this section are unprotected by seawalls or fronted by low, poorly constructed walls. Although the flood elevations along this section are the lowest along Old Orchard Beach, the poor quality and low height of the seawalls dictate that these areas should receive a substantial dune construction or expansion effort in the near future.

4.1.4 The Northern End of Grand Beach

The northern end of Grand Beach to the Scarborough town line is uniformly vegetated for most of its 2,500 foot length. Several lots close to the Scarborough line are devoid of vegetation because of uncontrolled foot-traffic from tourist housing facilities, but the remainder of the section is characterized by a 50' to 70' wide dune field with ridge heights of about 12' to 13' elevations.

Flood elevations along this section of Old Orchard Beach are uniformly high -- 15'. While most of the shorefront lots are protected by 14' to 16' high seawalls, the relatively low nature of the dunes indicate that any effort to strengthen the dunes should concentrate on increasing the height of the existing dunes -- the dune field has reached its maximum width across the backbeach without substantial fence protection.

4.2 The Existing Maintenance Program

The existing dune maintenance program conducted by the Town of Old Orchard Beach includes maintaining fencing around the dunes south of the pier section, including the maintenance of some boardwalks along the public rights-of-way across the dunes. This maintenance program was initiated in 1979 after the dune planting effort in Ocean Park and parts of the beach north of Ocean Park. Ocean Park residents maintain boardwalks along many dune access paths fronting this section of the beach.

Over the past seven years, the fencing has remained in place, even during the winter months. Boardwalks maintained by the Ocean Park residents have been removed during the winter. The snow-fencing has deteriorated to a point where it has lost its effectiveness along the front of the dunes along many sections of the dune. Vandalism has added to the deterioration of the fence.

As part of the short-term dune maintenance program initiated with the sewer pipeline construction program during the Spring and Summer months of this year, the Town has contracted to replace all snow-fencing, move the snow-fencing more seaward to protect any vegetation growing outside the original fence line, fill in eroded pathways, and erect boardwalks in all public rights-of-way accross the beach. The fencing portion of this effort has been completed.

Elsewhere along the length of Old Orchard Beach, any protective fencing has been erected and maintained by private individuals and is limited to very short sections of dune vegetation.

The 1979 dune management plan suggested several overall and specific management goals which could be implemented to improve the conditions of the planted dunes. The existing maintenance program has failed to accomplish several goals which these consultants feel are important:

- Failed to remove snow-fencing during the winter, coastal storm season to prevent wave damage to fencing and allow wind-transported sand to migrate throughout the width of the dune fields to add to the height of the dunes.
- Failed to maintain boardwalks within public rights-of-way inducing erosion of these unvegetated areas. The 1979 plan recommended raised boardwalks be constructed, but raised boardwalks are not recommended because of their expense and liability factors.
- Failed to promote the expansion of dunes north of the pier area.

5.0 SITE-SPECIFIC DUNE AND FLOOD HAZARD CONDITIONS

In order to provide a detailed assessment of the current dune status and flood hazard potential for town officials and shorefront property owners alike, a site-specific study of shorefront conditions was conducted along the entire length of the beach. The results of this survey are summarized in the following fold-out 1" = 200' maps of the shorefront sections of Old Orchard Beach.

These detailed maps summarize the conditions along segments of the beach which, because of their similar characteristics, can be treated alike from a dune management perspective. The maps were constructed utilizing the flood insurance rate base maps, a copy of which was obtained from the Maine Geological Survey. The information on these base maps were updated by utilizing E.C. Jordan Co. topographic maps of the dune area south of the pier as well as from observations by the consultants.

The maps identify sections on the basis of the characteristics of the dune field, seawalls, and recreational use levels. Included are the overall long-term management goals for each section.

Several features of the maps require explanation. The existing structural development of the areas behind the beach covers an area of one block. Rectangular features represent existing buildings, hatchured areas represent swimming pools, open-fencing by lines with x's, and structures constructed or under construction since 1978 by dashed rectangles.

Thick black lines seaward of the developed portions represent the position and extent of existing seawalls.

Thin contours represent 5' contour elevation levels based on a NGVD datum and were derived from the FIRM working maps. The "0" contour is NGVD and represents the approximate mean tide level.

The location of Surf Street is outlined in short dashes. This information was copied from a survey conducted by Dow and Coulombe Engineers and scale-transferred to the segment maps.

5.1 Segment 1: Scarborough Line to
North End of Wavelet Street

The northernmost segment of Old Orchard Beach is characterized by healthy 60' to 75' wide sand dunes which are developed to their fullest width and height. The dune height is low, ranging from an elevation of 9' to 12' throughout most of the dune sections length. The low height is attributed to the fact that this section receives little wind-blown sand from the narrow backbeach area and southern segments of Old Orchard Beach which trap wind-blown sand before it can reach this section of the dunes.

While the dune height in this segment is low, most of the properties landward of the dune are protected by a higher dune ridge (15' elevation) or seawalls which are at an elevation of 14' to 16'. The existing seawalls are in fairly good condition and can withstand high wave energy.

The existing dune field extends from the Scarborough line to the Pine Point Vista Condominiums. From this point south to the north end of Wavelet Street there are no dunes except for a very thin segment of vegetation at the very end of Wavelet Street. Further, some of the properties along this southern segment are unprotected by seawalls.

This segment experiences flood heights ranging from 12' to 15', from south to north.

This segment of Old Orchard Beach requires dunes of sufficient height and width to protect development from a range of flood hazards. Since this area receives little sand naturally, sand will have to be artificially placed and new dune grass planted. The existing dunes should be increased in height from 9'-12' to an elevation of 14' to 15' to decrease the potential for wave wash over seawalls, and dunes should be constructed where they are presently non-existent. Newly-constructed dunes should be constructed to a width of 40' and a height of 14'.

Recreational use levels along this portion of the beach are presently low, but will experience a rapid increase in use as underconstruction high-rise condominiums are completed and filled. Effort will have to be expended in managing foot-traffic across the dune to the beach from these condominium projects.

Dune areas immediately fronting motels and cabin units are devoid of vegetation and will require sand fill and planting with beach grass.

5.2 Segment 2: North End of Wavelet Street to Mullen Street

5.2.1 Section 3: Wavelet Street to Ladd Avenue

This section has no dunes and is characterized by heavy recreation usage of the beach from adjacent motels. The seawalls are of adequate condition and height to protect development because flood elevations are relatively low - 12' to 13' elevations.

The backbeach area experiences an accumulation of windblown sand which is at or only 1' below the tops of existing seawalls. Many property owners along this section would like to remove sand in front of their walls to prevent overtopping and maintenance problems.

5.2.2 Section 2 and 1: Ladd Avenue to Mullen Street

These sections are characterized a few dune segments separated by backbeach areas with no dunes. Recreational use of the beach in these segments is varied, and the absence of dunes is directly related to the non-control of foot traffic across the backbeach area.

Section 2 has adequate seawall protection .

Section 1 is characterized by low, poorly constructed seawalls with heights less than 13' -- the flood elevation for this section of Old Orchard Beach.

Augmenting the sparse, existing dunes with new dune growth, both by constructing new dunes in Section 1 and expanding the existing dunes by natural means in Section 2 is desirable.

5.3 Segment 3: Mullen Street to Old Orchard Street

5.3.1 Section 3: Mullen Street to Walnut Street

This section has no dunes and is characterized by low, poorly constructed seawalls from Mullen Street to York Street. From York to Walnut Streets, the walls are substantially 1' to 2' higher than the flood elevation. Sand can be excavated from in front of walls in this section and utilized to build dunes from Mullen to York Streets. Later, dunes should be established from York to Walnut Streets.

5.3.2 Section 2: Walnut Street to Aldine Terrace

Section 2 is characterized by isolated dune segments separated by unvegetated backbeach. Seawalls are absent in front of some structures, including SeaWatch Condominium.

The flood hazard in this area is relatively high, since the flood elevation is 14'. This section requires additional dune width, length and height.

5.3.3 Section 1: Aldine Terrace to Old Orchard Street

This section is adequately protected by existing seawalls and experiences some of the highest uncontrolled foot-traffic on Old Orchard Beach. It is doubtful that dune growth could survive even with substantial dune management controls.

5.4 Segment 4: Old Orchard Street to Bay Avenue

5.4.1 Section 2: Old Orchard Street to 4th Avenue

This section is an extension of Segment 3. The area is heavily used by recreational foot-traffic from the amusement area and hotels. There is little hope of establishing dunes in this section.

5.4.2 Section 1: 4th Avenue to Bay Avenue

This is the northern-most section of the previous dune management effort. The dunes are fairly healthy along their entire 75' to 80' width. 40' of their width has just been covered with mesh after construction of the pipeline and will be replanted with new grass during the Fall, but natural growth is reestablishing itself. Previous to the pipeline construction, grass behind the frontal dune ridge showed signs of losing its growth vigor due to the front snow-fencing preventing the transport of sand from the front of the dune to the rear areas.

These dunes, in places, exceed 20' in height and provide adequate protection from the existing flood hazard. Foot-traffic in the unboarded walkways, however, has allowed sections of the rights-of-way to become eroded several feet below the surrounding vegetated dune terrain. The short-term pipeline mitigation work will fill these walkways with sand and cover the paths with boardwalks.

Observations indicate that the dunes can be widened along their front and at the ends of walkways by allowing vegetation to colonize their desired area on the backbeach.

5.5 Segment 5: Bay Avenue to Winona Avenue

5.5.1 Section 2: Bay Avenue to Odena Avenue

This section of dunes are relatively narrow compared to the rest of the dune field south of 4th Avenue. The dunes average 50' in width and can be extended further seaward by promoting the natural widening and heightening by proper dune management. This segment is the southerly segment

along which the recent sewer pipeline has been buried, and will be replanted with new dune grass in one month. Rights-of-way have been filled in and will receive boardwalks shortly as part of the short-term pipeline mitigation program.

Flood elevations range from 12' to 15' with dune heights averaging 14 to 15'. Flood protection is adequate and will be improved with widening and heightening.

5.5.2 Section 1: Odena Avenue to Winona Avenue

The dune field is over 80' wide for most of its length in this section. Dune heights range from 15' to 20' elevations and are more than adequate to provide adequate flood protection against 15' elevations existing flood levels. The dune field can be widened further to approximately 100' by allowing natural vegetation to propagate inside fenced areas. The fencing in this area has just been replaced and moved seaward. Right-of-way fencing has also been extended seaward to a point parallel with the front of the dune field to either side of the pathway. Rights-of-way require sand fill to bring them up to existing, adjacent dune heights and boardwalks provided in all rights-of-way to prevent foot-traffic erosion.

5.6 Segment 6: Winona Avenue to Goosefare Brook

5.6.1 Section 3: Winona Avenue to Sandpiper Road

This section has equivalent conditions to Segment 5, Section 1 with one exception. Because of high recreational use emanating from the Ocean Park Association to the beach, deep "V" cuts occur at the head of rights-of-way. These cuts are as much as 50' to 60' deep, 100' feet wide, and 3' to 5' below the elevation of the surrounding dune field. These areas will require artificial fill with dune sand, fencing, and dune planting in order to bring the frontal dunes into their natural configuration.

However, the existing high and wide dune field provides adequate flood protection to 100-year storm waves.

5.6.2 Section 2: Sandpiper Road to Blaine Road

This section encompasses the northern end of the seawall at the very southern end of Old Orchard Beach. The dune are approximately 20' wide and 5-6' high with a dune crest just seaward of the seawall.

This and the next section have the highest flood potential along the entire length of the beach, as the structures lie on the foredune and have been damaged in previous storms. Response to previous storms has resulting in the construction of stronger and higher seawalls, but the

present State of Maine Sand Dune Regulations prohibit the future strengthening and heightening of this wall.

The beach is very narrow in this section and dune construction or extension will be limited to about 10' only. This section will require artificial construction of a dune 5' higher and 10' wider than at present.

5.6.3 Section 3: Blaine Road to Goosefare Brook

This section fronts 4 dwellings immediately behind a concrete seawall with sparse dune vegetation growing just in front of and on top of the wall. The flood hazard and beach widths are equivalent to the previous sections, but the dunes fronting this section are lower and narrower in this section. A narrow dune, 20' wide, 5' high dune should be constructed and vegetated here.

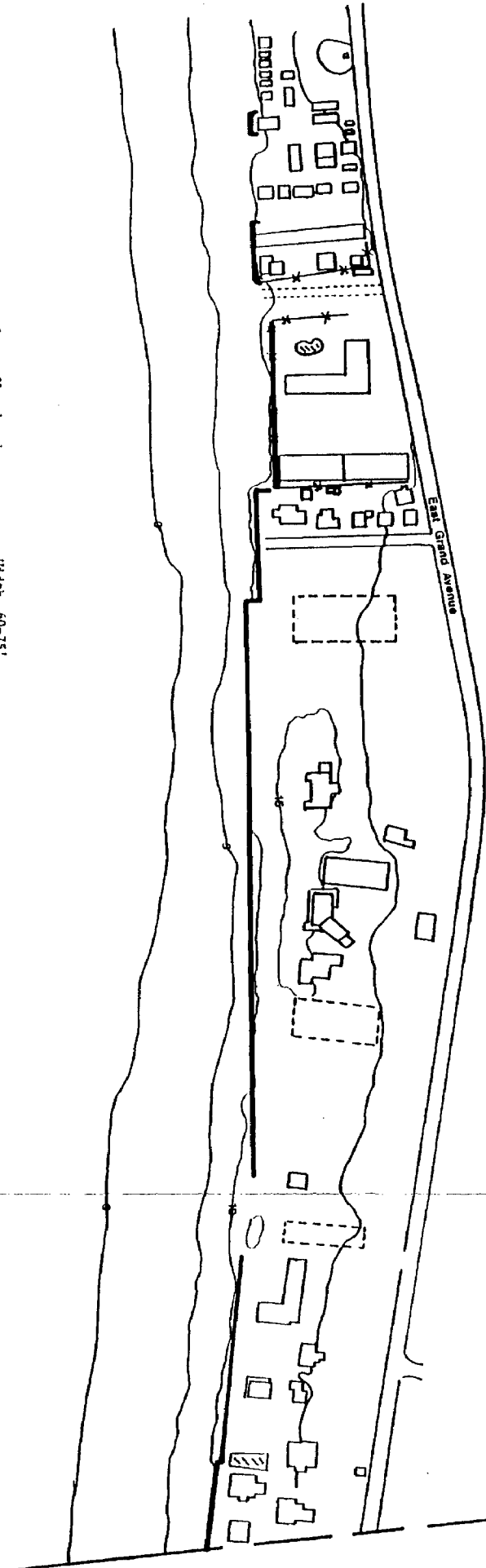
The flood potential is so high in these last two sections that the dune construction and planting effort along this area will not survive a 100-year storm, but will be effective in lessening flood damage from more moderate storms (5-year to 25-year coastal storms).

OLD ORCHARD BEACH

DUNE MANAGEMENT STUDY : Scarborough Line to North End of Wavelet Street

EARTH SURFACE RESEARCH, INC.
1986

Scale: 1" = 200'
Datum: NGVD



EXISTING DUNE CONDITIONS LEVEL OF USE

Long, flat beach
Low, healthy dunes fronting
seawall, dunes are at full
width
Width- 60-75'
Height- 3-5'
Elevation- 9'

Low usage, little public access

EXISTING FLOOD HAZARD

Flood elevation - 15'
Flood hazard low, adequate
protective seawalls

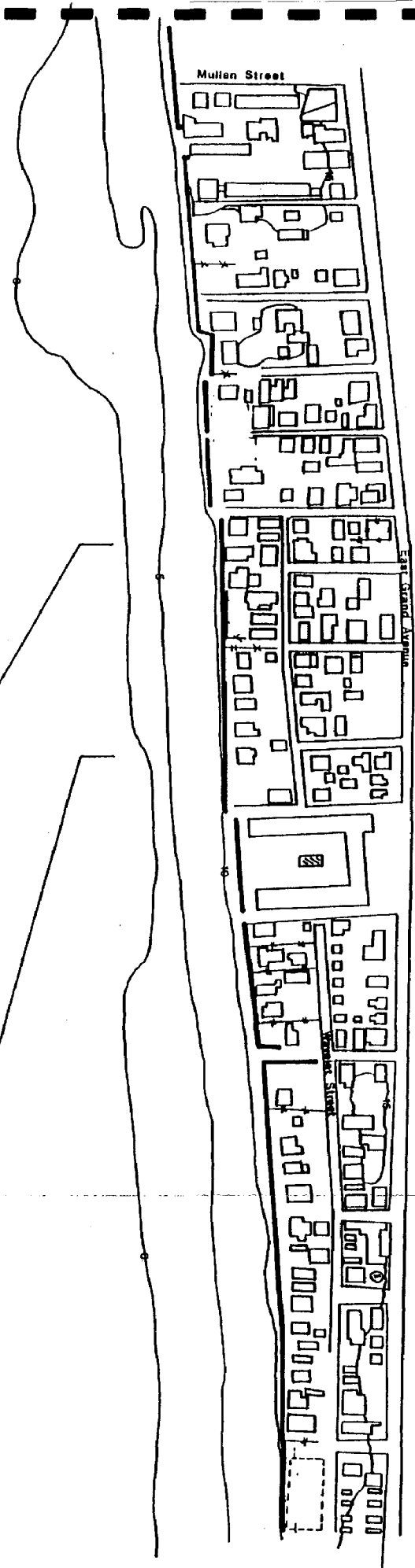
LONG TERM MANAGEMENT GOAL

Promote natural or artificial
increase in dune height. Large-
scale condo projects recommended
to construct dune or airport excavated
sand to needed areas.

OLD ORCHARD BEACH DUNE MANAGEMENT STUDY: North End of Wavelet Street to Mullen Street

EARTH SURFACE RESEARCH, INC.
1986

Scale: 1" = 200'
Datum: NGVD



EXISTING DUNE CONDITIONS LEVEL OF USE	<u>Section 1</u> no dunes, all seawall frontage. Small area of vegetation in center of section usage heavy	<u>Section 2</u> small dune area, healthy vegetation usage heavy	<u>Section 3</u> no dunes, wind blown sand along seawall frontage usage heavy
	Width - 0 Height - 0 Elevation - 10'	Width - 70' Height - 2' Elevation - 13'	Width - 0 Height - 0 Elevation - 11'

EXISTING FLOOD HAZARD

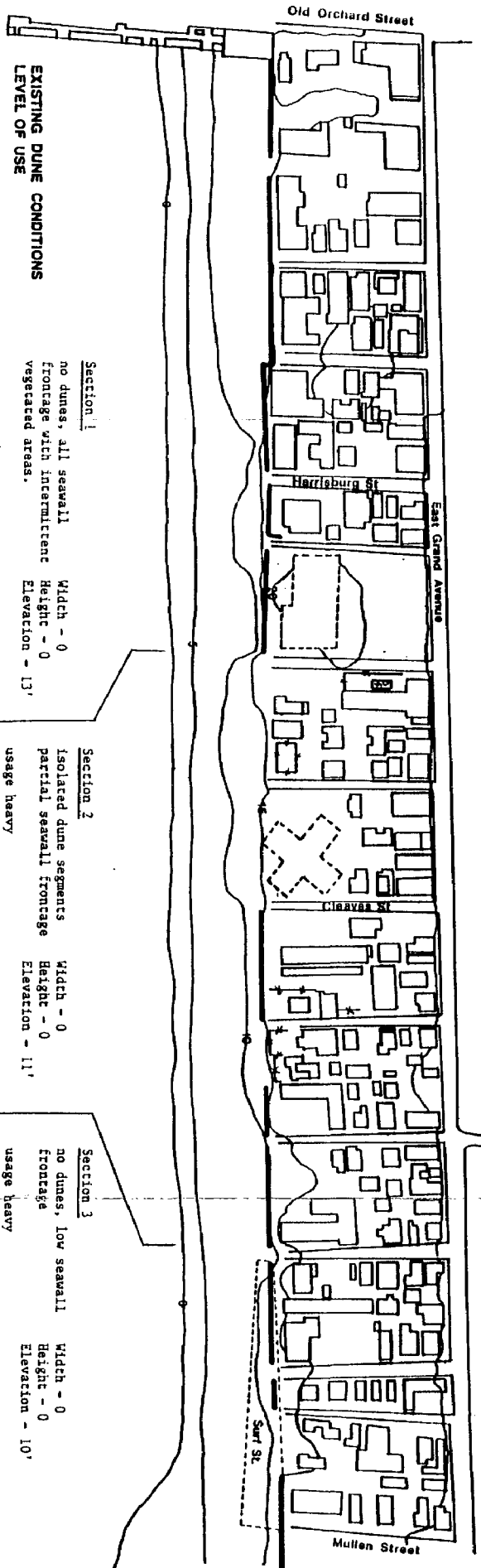
Flood Elevation - 13'
flood hazard high in Sect. 1,
flood hazard lower in Sects. 2,3
and areas with higher protective
seawalls

LONG TERM MANAGEMENT GOAL

Promote dune growth between Scollard Rd.
and Seabreeze Ave. to 30-40' width at
elevation 13'. Remove built up sand
from Sect. 3 and use to promote growth in
other areas.

OLD ORCHARD BEACH DUNE MANAGEMENT STUDY : Mullen Street to Old Orchard Street

EARTH SURFACE RESEARCH, INC.
1986
Scale: 1" = 200'
Datum: NGVD



EXISTING FLOOD HAZARD

Flood Elevation - Sects. 1 & 3 - 14'
Sects. 2 - 13'
flood hazard moderate in Sects. 1 & 2,
flood hazard high in Sect. 3, seawall
height not adequate

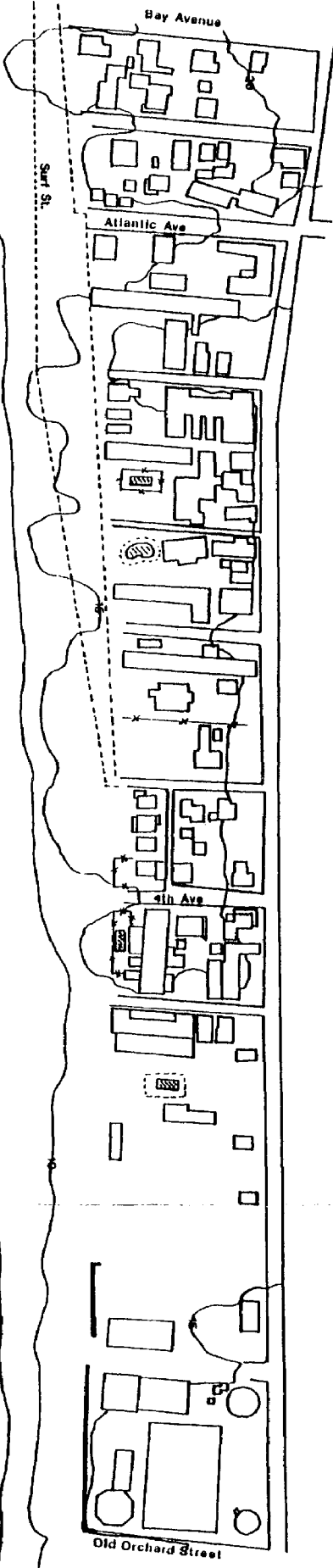
LONG TERM MANAGEMENT GOAL

Promote artificial dune building
in Sects. 1 & 3. Promote dune
growth in Sect. 2 by expanding
existing dunes through management
effort. Dunes could grow to a 20'
width and a 3' height.

OLD ORCHARD BEACH DUNE MANAGEMENT STUDY: Old Orchard Street to Bay Avenue

EARTH SURFACE RESEARCH, INC.
1986

Scale: 1" = 200'
Datum: NGVD



Section 1

**EXISTING DUNE CONDITIONS
LEVEL OF USE**

Narrow dunes, no
seawall frontage
Usage heavy, public access
provided

Width - 50-80'
Height - 15-20'
Elevation - 13-15'

Section 2

No dunes
Usage at
maximum

Width - 0
Height - 0
Elevation - 13-15'

Flood Elevation 12-13' for Sect. 1,

Flood Elevation - Sect. 1 - 12-13'
Sect. 2 - 15'

Flood hazard low to moderate, adequate
dune height and protective seawalls
in front of structures

LONG TERM MANAGEMENT GOAL

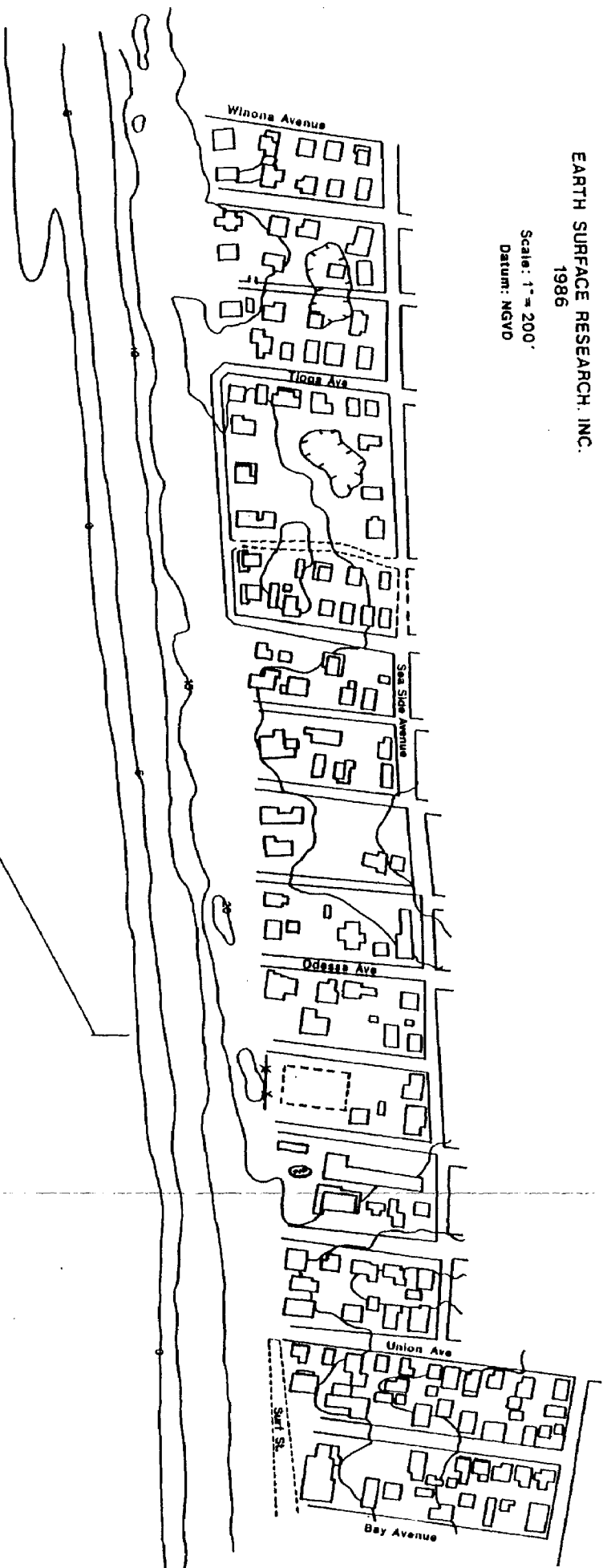
Promote expansion of dunes by
moving fencing seaward. Fill in
walkways with boardwalks.

This section receives heaviest foot
traffic, little hope of controlling
access, no recommendations for
change

OLD ORCHARD BEACH DUNE MANAGEMENT STUDY: Bay Avenue to Winona Avenue

EARTH SURFACE RESEARCH, INC.
1986

Scale: 1" = 200'
Datum: NGVD



**EXISTING DUNE CONDITIONS
LEVEL OF USE**

Section 1
dunes at full width,
very healthy vegetation
erosion at boardwalks
usage heavy

Width - 100'
Height - 3-4'
Elevation - 15'

Section 2
dunes very narrow
dune grass unhealthy
erosion at boardwalks and
right-of-ways
usage very heavy, public
access available

Width - 50'
Height - 21-3'
Elevation - 12'

EXISTING FLOOD HAZARD

Flood Elevation - 15' for Sect. 1
12' for Sect. 2
flood hazard low for Sect. 1
flood hazard high for Sect. 2

LONG TERM MANAGEMENT GOAL

Promote natural or artificial
widening and heightening of dunes,
fence could come out 30-50' in Sect. 2,
all boardwalk fences should meet at
right angles and all boardwalks should
be widened 7-6'

OLD ORCHARD BEACH DUNE MANAGEMENT STUDY: Winona Avenue to Goosefare Brook

EARTH SURFACE RESEARCH, INC.
1986

Scale: 1" = 200'
Datum: NGVD



EXISTING DUNE CONDITIONS LEVEL OF USE	Section 1	Section 2	Section 3
	steep beach, no berm low dunes fronting seawall dune grass unhealthy usage moderate, little public access	low dunes partially fronting seawall, erosion at boardwalks unhealthy dune grass moderate usage	dunes healthy erosion at boardwalks usage moderate to heavy
	Width- 20' Height- 1-2' Elevation- 9'	Width- 20' Height- 5-6' Elevation- 10'	Width- 105' Height- 5-6' Elevation- 15'

EXISTING FLOOD HAZARD	Flood elevation - 15' flood hazard high for Sects. 1, 2 flood hazard low for Sect 3.
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LONG TERM MANAGEMENT GOAL
Promote natural or artificial widening and heightening of dunes, fence could come out 4-8' in Sects. 1 and 2 and 20-40' in Sect. 3, all boardwalk fences should meet at right angles and all boardwalks should be raised 1-3'. Boardwalk areas are good candidates for excavated sand deposition.

6.0 CONCLUSIONS

1. The dune planting effort and 1979 dune management have been effective in creating twice the area of dunes than existed 10 years ago. Not only have planted and managed dunes increased in height and area, but the awareness which the planting and management effort applied at the Ocean Park section imparted to the rest of the citizens of Old Orchard Beach has led to an increase in the amount of dunes along portions of the Grand Avenue section of the beach.
2. The dune management effort since 1979 fell short of the goals of the 1979 plan in that boardwalks were not established at all rights-of-way across planted and fence-protected dunes; fencing was unmaintained until recently; and the expansion of isolated dunes along the southern Grand Avenue section of the beach was not undertaken.
3. The dune management fell short of its goals for the following reasons, among others:
 - No formal mechanism was created to oversee, plan, and fund a continuous management effort.
 - The 1979 plan was unable to predict future maintenance needs.
 - The 1979 plan proposed the construction of elevated boardwalks which are expensive and present liability and unrealistic maintenance problems; consequently the boardwalk issue was never addressed except by private individuals.
 - There remains a general perception among public officials, businesses, and private individuals that the recreational and tourist traffic on the beach is too high to successfully maintain dunes along certain areas of Old Orchard Beach.
4. After seven years, snow-fencing, especially along the front of the dunes has deteriorated to a condition where it no longer serves as a protective barrier to foot-traffic and trespassing on the dunes. Information from local officials indicate that vandalism plays a large part in shortening the

effective lifetime of the fencing if it remains in place continuously.

Despite the deterioration of the fencing, the fence and local dune trespassing ordinance have served to keep foot-traffic off vegetated areas for the most part. Trespassing has been noted along the frontal dune slope where fencing has deteriorated to a point of no longer being effective.

5. Despite the above-cited problems, the dune management effort in Old Orchard Beach has been the most successful public/private dune management program in the State of Maine considering the length of the dune resource which must be protected and the very high level of recreational use of the beach.
6. The recent sewer pipeline project requiring burial a portion of the line in the backdune area from 4th Avenue to Odessa Avenue spawned a renewed municipal dune management effort leading to the complete replacement of snow-fencing around the dunes, filling-in of eroded rights-of-way through the dunes, and the construction of removeable boardwalks for rights-of-way where they previously did not exist for much of the dune area south of 4th Avenue.
7. The availability of federal coastal storm flood data in 1984 allows for the determination of which beach areas require future dune protection to minimize structural damage along the developed shorefront, as well as a prioritization basis to direct future dune management and construction efforts to those areas most susceptible to future storm hazards.

Areas highly susceptible to future coastal storm flood hazards include structures built on the foredune without extensive dunes at the very southern end of Old Orchard Beach and some developed areas of south Grand Beach with high 100-year flood elevations, seawalls of poor structural integrity and low heights not fronted by dunes.

8. Observations of the existing dunes and unvegetated backbeach portions for most of the length of Old Orchard Beach indicate that existing dunes can be expanded and/or constructed across the backbeach without diminishing recreational beach use.

The section of beach from Aldine Terrace south to 4th Avenue is an exception to this observation. The intense level of recreational use of this portion of the beach, the nature of the developed upland (pier, amusement park, restaurants and lounges), and the lack of controllable access to the beach precludes the ability to create and maintain any dunes along this segment.

9. While existing dune areas can be expanded by the careful application of dune management techniques to allow for the natural accumulation of wind-blown sand and propagation of existing vegetation, some areas will require clean sand fill and the planting of commercially-available beachgrass.

Clean sand fill can be obtained from within the Old Orchard Beach barrier system, itself. Two readily identifiable sources are:

- Excess dune sand available from the foundation and parking lot excavation of future large, high-rise multiple housing projects currently being built along the Grand Beach section of Old Orchard Beach.
- Sand accumulating in front of seawalls along certain sections of the southern Grand Beach section where the susceptibility to future flood hazards are low.

Sand can be obtained from the first source through exercising the authority of the Old Orchard Beach Planning Board to apply a condition to construction permits stipulating that all excess compatible sand be released to the Town for use as dune construction material and that contractors will undertake the recommended dune management scenario for the dune or backbeach areas encompassed within their developments..

For the past five years, several shorefront property owners along portions of Grand Beach and further south have desired to remove windblown sand which periodically accumulates against their seawalls. Because these areas are without vegetation, the sand accumulates to the tops of the walls and blows over them. Also, minor and moderate storms wash waves over the walls because the accumulated sand acts as ramp for wave runup.

Sand may be removed from these areas for a short-term period as long as the sand is used to construct sand dunes along shoreline areas where the potential for flood damage is higher than that of the sections where the sand is being taken from. After high priority shoreline segments have dunes established, the areas from which sand is taken should be allowed to accumulate sand in order to create dunes.

The creation of dunes, over the long-term, will prevent the very nuisance for which the property owners desire the sand removed from in front of their walls -- it will prevent the blowing of sand over into parking, patio, and lawn areas by stabi-

lizing it with vegetation.

10. Since the dune planting program and initial management plan of 1979, seven years have passed. Observations of the natural spread of dune grass along Maine beaches and the potential ability for grass at Old Orchard Beach to spread, it is not unreasonable to believe that a ten-year time-frame is sufficient to accomplish the creation of dune fields along the entire length of Old Orchard Beach except for its mid-portion to either side of the pier.

7.0 RECOMMENDATIONS

Observations of the existing conditions of the dunes at Old Orchard Beach coupled with the accomplishments of the 1979 dune planting and preliminary dune management effort, indicate that it may be possible to create an almost continuous dune field over the length of Old Orchard Beach within a ten-year time frame.

It is the goal of the following recommendations, to accomplish the creation of this dune field over the next ten years. However, it is not the intent of the following recommendations to obligate the Town of Old Orchard Beach to a ten-year program. To accomplish all of the following recommendations to create a continuous dune field (with the exception of the central section of Old Orchard Beach centered on the pier) a commitment of labor and funding will be necessary. Future commitments of labor and monies to affect the long-term dune management plan will have to be made in competition and consideration with other municipal needs and priorities. The level of commitment will dictate the length of time within which the management plan is accomplished.

The recommendations are presented in two categories. The first category of recommendations are general recommendations which are needed to accomplish specific dune management tasks, no matter where applied along Old Orchard Beach. The second category of recommendations are specific recommendations for future courses of actions and tasks to be applied to specific shoreline segments of Old Orchard Beach.

7.1 General Recommendations

1. The Town Council of Old Orchard Beach should form a dune management committee to plan, oversee, and advise the Town of Old Orchard Beach on matters concerning the management of the coastal dunes. It is suggested that this committee include one member from the town council, one member from the planning board, one member from the Chamber of Commerce, and two shore-front property owners appointed by the Chairman of the Town Council.
2. Fencing should be maintained around existing and any future vegetated coastal dunes. Fencing along the ocean face of the dunes and along the right-of-way walkways back to the crests of the dunes should be removed during the winter months (November 1 through

April 1) to permit the natural transport of wind-blown sand to widen and heighten the existing vegetated dune field.

Because of very low pedestrian use of the beach north of the Pine Point Vista Condominiums along Grand Beach, fencing is not required presently. Fencing may be required in the future, however, as condominiums are completed and filled, increasing the level of recreation along this portion of the beach.

3. Fencing, when replaced after the winter months, should be moved 5' seaward from its previous year's position to allow for the protection of dune vegetation which extends itself over the backbeach through natural propagation. A gradual expansion of the front of the dunes will allow for beach recreation to conform to the extension of the dunes on an incremental basis.
4. Removeable boardwalks should be provided for each public right-of-way leading across the dunes. These boardwalks should be constructed according to the specifications provided by the E.C. Jordan Co. for the boardwalks planned for the section of dunes from 4th Avenue to Odessa Avenue as part of the short-term sewer pipeline construction mitigation effort. Boardwalks should be removed from the right-of-ways in conjunction with winter fence removal. Boardwalks should be also be extended seaward when the front fencing is extended seaward to expand the dune area. Seasonal boardwalk removal will ensure that right-of-ways will fill with sand naturally and keep pace with dune heightening and widening.

Boardwalks and fenced right-of-ways should not exceed 4' in width.

5. Snow-fencing, if removed from the front and seaward portions of right-of-ways during the winter months, should remain in reasonable condition to prevent trespassing on the vegetated dunes for a ten-year period. Vandalism of the fencing, most likely, occurs during the winter months when use of the beach has decreased considerably.
6. Planting of newly-constructed dunes should be accomplished according to the recommendations of the 1979 dune management plan (Appendix II).
7. The Town of Old Orchard Beach Planning Board and Town Council should provide provisions in the existing zoning ordinances to utilize excess dune sand excavated from beach development projects for the purposes of constructing new dunes where specifically recommended in the following section on specific recommendations. Further, provisions should be made within the zoning ordinances to impose conditions on

shorefront development to undertake the recommended course of action of dune management recommended for the given section of beach where the development takes place. In these instances, dune management within the property of the development, should be at the expense of the developer with informational assistance provided by the Town.

Beach excavation and dune construction undertaken by the Town of Old Orchard Beach or any developer or individual requires a Sand Dune Alteration Permit from the Maine Department of Environmental Protection, Bureau of Land Quality Control.

7.2 Specific Recommendations

The following specific recommendations are made for the management or construction of new dunes along specific sections of Old Orchard Beach. The sections conform to the sections discussed in section 5. Recommendations for courses of action within each section are given a time frame for accomplishment of either 5 years or ten years. Further, where artificial dune construction is recommended, the plan prioritizes the need for construction on a 1 through 4 basis. A priority of 1 indicates highest priority -- a priority of 4, the lowest priority. The priority score is based upon any given section's potential for flood damage in the future. Dune construction should be conducted in the section with a priority score of 1 first, a priority of 2 second, etc., etc.

1. Scarborough Town Line to Right-of-Way North of Wavelet Street

Existing dunes do not need widening, but need to be artificially heightened to an elevation of 15' utilizing sand excavated from beach development along this section of Old Orchard Beach. New dune construction and planting should be the responsibility of the developers of projects as stipulated by the Planning Board on projects north of Pine Point Vista Condominiums. New dune construction is required from the Right-of-Way to Pine Point Vista Condominiums, as no dunes exist there presently. Dunes should be constructed to an elevation of 15' and a width of 60'.

Dune construction requires a Sand Dune Alteration Permit from the Maine Department of Environmental Protection.

Time Frame for Accomplishment: 10 years

Priority for Construction (1 through 4 basis): 4

2. Right-of-Way North of Wavelet Street to Ladd Avenue

The section is heavily used by tourists from adjacent motels and inns. The seawalls along this section are of adequate height and structure to provide for flood protection. Windblown sand accumulates to the top of the walls and is lost to the system by washover and wind. For the short-term (5 years) sand may be excavated to a depth of 2' below the tops of the walls and used to construct dunes in high priority areas elsewhere along the beach. For the long-term (year 5 to year 10), sand accumulating along the fronts of walls should be planted with beachgrass and protected with fencing to promote the establishment of dunes.

Excavation of sand from this section of the beach requires a Sand Dune Alteration Permit from the Maine Department of Environmental Protection.

Time Frame for Accomplishment: Phase 1 - 5 years
Phase 2 - 10 years

3. Ladd Avenue to Morrison Street

Develop a 14' elevation dune, 50' in width by extending existing segments of vegetated dunes by protecting dune areas with fencing and boardwalks in public right-of-ways. The existing dune vegetation will propagate naturally to fill in the unvegetated areas.

Time Frame for Accomplishment: 5 years

4. Morrison Street to York Street

Artificially construct a 20' wide, 13' elevation dune along this section of the beach. Utilize sand from other sections as recommended and plant with beachgrass acquired from commercial sources.

Dune construction requires a Sand Dune Alteration Permit from the Maine Department of Environmental Protection.

Time Frame for Accomplishment: 5 years

Priority for Construction (1 to 4 basis): 2

5. York Street to Walnut Street

Sand accumulated in front of seawalls can be excavated to 2' below tops of walls and utilized in sections where dune construction is recommended. This can

occur for first 5 years of plan. From year 5 to year 10, sand should be allowed to accumulate and vegetation from neighboring dunes allowed to propagate to vegetate new dune field. Dune area should be fenced off and boardwalks provided at the end of year 5. New dune should be established in 10 years.

Excavation of sand from this section requires a Sand Dune Alteration Permit from the Maine Department of Environmental Protection.

Time Frame for Accomplishment: Phase 1 - 5 years
Phase 2 - 10 years

6. Walnut Street to Aldine Terrace

Promote natural expansion and growth of existing dunes using protective fencing and boardwalks in public right-of-ways.

Time Frame for Accomplishment: 5 years

7. Aldine Terrace to 4th Avenue

No action recommended.

8. 4th Avenue to Oceana Avenue

Promote widening of dunes by moving fencing seaward and extend boardwalks to frontal fencing.

Time Frame for Accomplishment: 5 years

9. Oceana Avenue to Sandpiper Road

Seaward ends of right-of-ways are 2 to 3' below adjacent dune elevations. These areas require sand fill from other areas of the beach and planting with commercially-acquired beachgrass to bring the dune topography and vegetation line even with adjacent, undisturbed dunes. Existing right-of-way areas need to be filled with sand to bring them up to level of adjacent dunes.

Dune construction within this section requires a Sand Dune Alteration Permit from the Maine Department of Environmental Protection.

Time Frame for Accomplishment: 5 years

Priority for Construction (1 to 4 basis): 3

10. Sandpiper Road to Goosefare Brook

Artificially construct 15' to 20'-wide dunes to an elevation of 15' utilizing sand from other sections of the beach.

Dune construction requires a Sand Dune Alteration Permit from the Maine Department of Environmental Protection.

Time Frame for Accomplishment: 5 years

Priority for Construction (1 to 4 basis): 1

8.0 REFERENCES CITED

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- Farrell, Stewart C., 1972. Coastal processes, historical changes and the post-Pleistocene geologic record of Saco Bay, Maine. Ph.D. dissertation, Univ. of Mass., Amherst, Mass.
- Moreau, Marcel; Childs, W.; Ferland, M.; and Kim Millberry, 1979. A study of beach processes and management alternatives for Saco Bay. Southern Regional Planning Commission, 82 pp.
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PLATES

- A. View of existing dune field in north of the Ocean Park section of Old Orchard Beach during the height of the tourist season.
 - B. Poor condition of fencing along the front of the dunes leads to careless trespassing on dune vegetation. These two bathers are retrieving a downed kite.
 - C. Narrow, low dune in front of an existing house and seawall just seaward of Blaine Avenue. This section of Old Orchard Beach has the highest flood hazard and is the highest priority for dune construction.
 - D. Extent of the dunes and fencing along the north end of Ocean Park. Fencing was in the process of being replaced. Note grass extending beachward of old fence line.
 - E. Looking north along the backbeach from 4th Avenue. Because of the intense level of use along this section of beach, dune construction is impossible.
 - F. Partial dunes just north of the pier. Note that dunes are absent where motel units abut the beach.
 - G. Section of dune along the Grand Beach section. Because use levels are low along this area, the dune has reached its natural width. The dune height, in this area, however, is low compared to potential flood levels.
- H1-3. Three photographs showing the effects of leaving fencing up during the winter season. H1 shows sand accumulating at the fence when it should be transported further into the dunes. H2 shows backdune beachgrass which exhibits poor growing health because sand cannot reach it to stimulate vigorous growth. H3 shows section of dunes which will be replanted after pipeline burial. The new plantings will revive the slowed growth evident in H2.

- I1-2. Photographs of the same section of dunes taken winter and summer of 1986. Note that grass in I2 is growing beyond the existing fence line and can spread another 10' to 15' without interfering with recreational use of the beach.
- J1-4. J1 is a photograph of a typical pathway without boardwalks. Walkway is several feet below adjacent dunes. J2 is an existing boardwalk which is removed in winter. It is about 1' below adjacent dunes. J3 receives windblown sand during the winter and fill to bring it up to level of the surrounding dunes. J4 is a private walkway which has been allowed to revegetate naturally.
- K. Unvegetated embayments at the heads of walkways at Ocean Park. These areas require clean sand fill and planting of grass to bring them along line with the rest of the dunes.
- L. Condominiums without dunes. Prime candidate for coastal storm damage.
- M. Lack of dunes in front of the Rosebriar Motel in Grand Beach. Foot-traffic control will allow dune vegetation to fill into bare areas.
- N1-2. Areas along Seaside where seawalls are absent, low or of poor structural integrity. These areas require dune construction to lessen the flood hazard.
- O1-2. Sections where sand accumulating against structurally-sound and high seawalls can be excavated to utilize sand to construct dunes elsewhere.

A



B



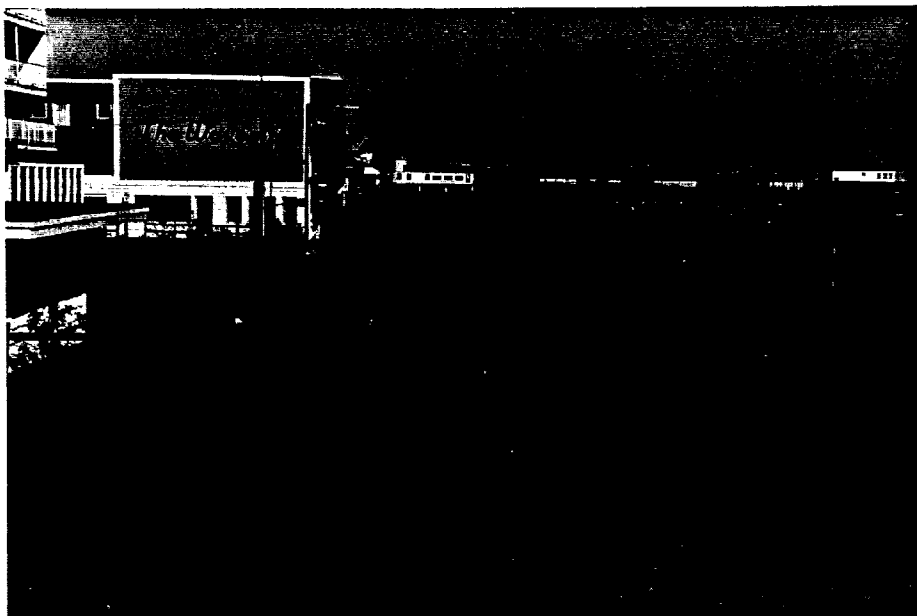
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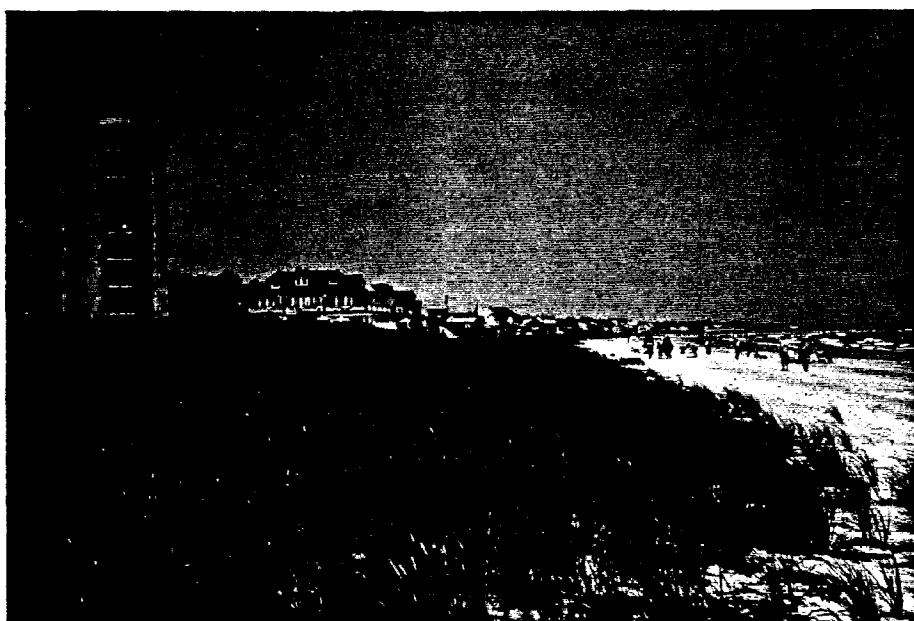
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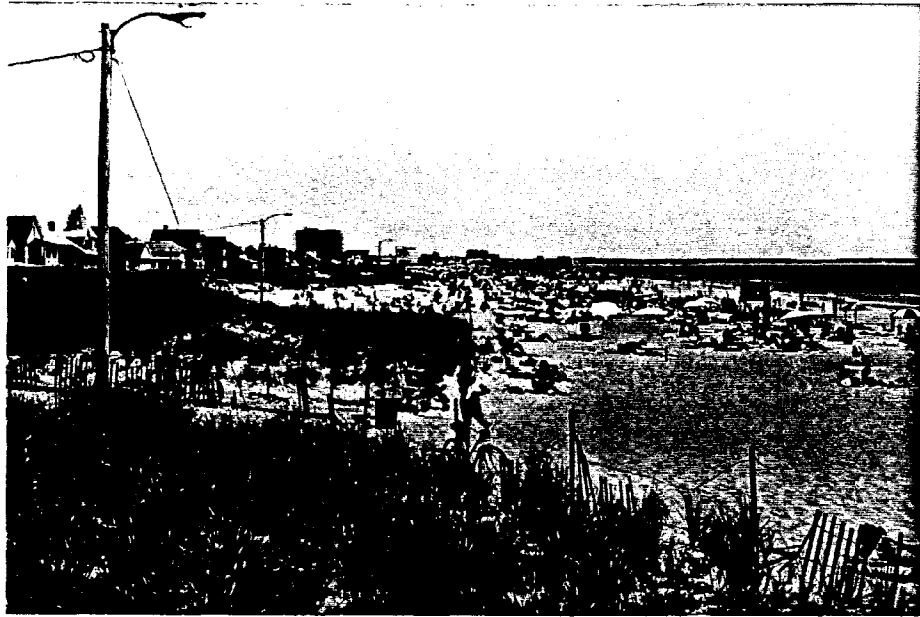
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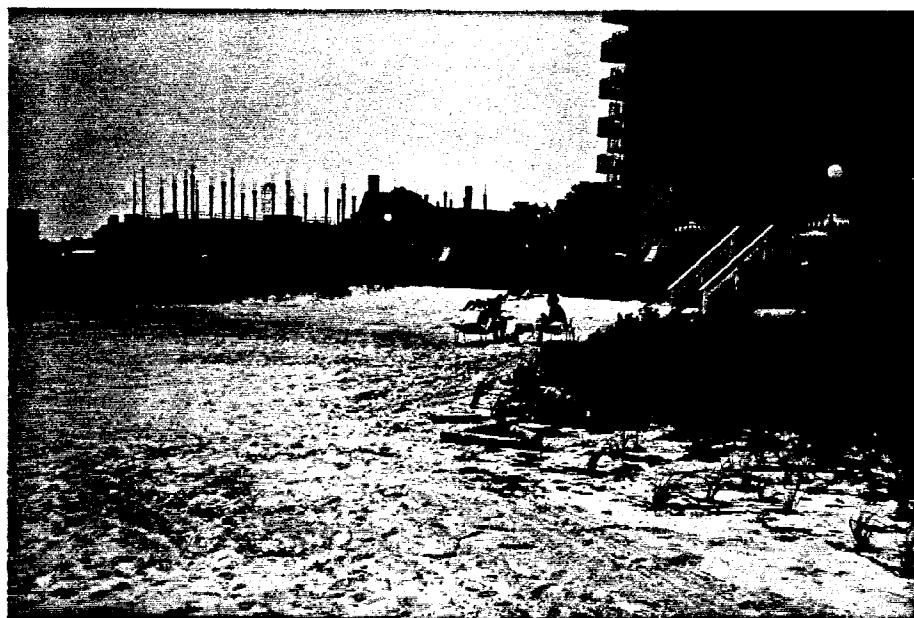
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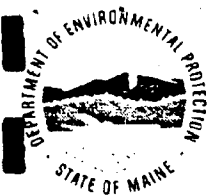


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APPENDICES

- I. Copy of the Board of Environmental Protection Order with a condition stipulating the undertaking of a Long-term dune management plan
- II. 1979 Dune Management Plan section on planting dune grass.



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE HOUSE STATION 17 AUGUSTA, MAINE 04333

DEPARTMENT ORDER

APPENDIX I

IN THE MATTER OF

TOWN OF OLD ORCHARD BEACH)	Alteration of Coastal Wetlands Act
Old Orchard Beach, Maine)	SAND DUNES
BEACH MITIGATION/RESTORATION)	
#L-011014- 04-B-M)	CONDITION COMPLIANCE

Pursuant to the provisions of Title 38, M.R.S.A., Section 474, the Department of Environmental Protection has considered the application of the TOWN OF OLD ORCHARD BEACH with its supportive data, staff summary, agency review comments, and other related materials on file and finds the following facts:

1. On December 18, 1985, the Board of Environmental Protection approved an application from the Town of Old Orchard Beach to place a pipeline across the beach in Old Orchard Beach, Maine. Reference is made to Department of Environmental Protection file #L-011014-04-A-N Condition 1 of that approval states:

"1. By February 1, 1986, the applicant shall submit to the Department for review and receive approval by the Commissioner a detailed construction mitigation/restoration plan which includes at minimum the following:

- a. A construction site plan indicating the actual locations of the proposed pipeline, all disturbed areas, all reconstructed dune areas, and proposed walkways.
- b. A dune grass planting plan which shall include the type of planting, (species and supplier) the technique used to plant the dune grass, (method and responsible parties) and a schedule of the planting sequence (expected dates and locations).
- c. A plan indicating the type of fencing to be used, where placed, and when and how the fencing is to be incorporated into the project.
- d. A detailed plan showing the construction design of the proposed boardwalks (profile drawings should illustrate minimum elevation above the dunes), a schedule of construction dates, and details specifying the methods used and the parties responsible for the actual construction of the boardwalks.
- e. Detailed cost estimates of the project and the type and amount of surities proposed."

CC: E. Townsend R. Day
 S. MacMillan R. Talbot
 B. Timson M. Curato (w/copy to N. Towns)

TOWN OF OLD ORCHARD BEACH
Old Orchard Beach, Maine
BEACH MITIGATION/RESTORATION
#L-011014- 04-B-M

2 Alteration of Coastal Wetlands Act
)
) SAND DUNES
)
) CONDITION COMPLIANCE

2. On February 7, 1986 the applicant submitted the following.

- A. A plan which indicated locations of the pipeline disturbed areas, reconstruction areas and walkways. All excavated sand will be used for backfill and/or retained in the sand dune system and used for restoration.
- B. A dune grass planting plan including grass species, supplier, planting techniques, and planting schedules. Provisions for a geologist to monitor the project and supervise the restoration were proposed. A monitoring geologist will inspect the site at least 3 times a week. A procedure for the monitoring geologist to order corrections or halt the project if the plan is not being followed or if terms of this order are not being met was included.

Any plantings or erosion controls which are washed out or damaged during the winter will be replaced in the spring. Fertilization of the plants will be done in the spring rather than the fall.

Provisions have been made for the top 2 to 3 feet of sand which contains active beach grass rhizomes to be replaced as cover material in the top 2 to 3 feet when backfilling. This will enable existing dune grass to help recolonize the dune.

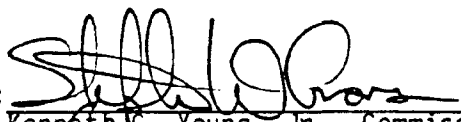
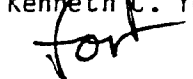
- C. A board walk plan showing its placement use and maintenance. Walkways will be held together with steel cable or webbing.
 - D. A fencing plan showing its placement use and maintenance. Any existing fencing will be repaired or replaced to assure an effective barrier to protect new growth.
 - E. A cost estimate for the mitigation/restoration plan.
3. Future maintenance of the restored area will be addressed in the beach management plan which is to be submitted by September 1, 1986 for review and approval.

BASED upon the above Findings, the Department concludes that the TOWN OF OLD ORCHARD BEACH has complied with Condition 1 of the Order for interceptor pipeline upgrade dated December 18, 1985.

DONE AND DATED AT AUGUSTA, MAINE, THIS 8TH DAY OF APRIL, 1986.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY:


Kenneth C. Young, Jr., Commissioner


November 1, 1979

****S T A N D A R D C O N D I T I O N S****

THE FOLLOWING STANDARD CONDITIONS SHALL APPLY TO ALL PERMITS GRANTED UNDER THE COASTAL WETLANDS LAW, UNLESS OTHERWISE SPECIFICALLY STATED IN THE PERMIT.

- A. Approval of Variations From Plans. The granting of this permit is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed to by the applicant. Any variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.
- B. Compliance With All Applicable Laws. The applicant shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.
- C. Compliance With All Permit Terms and Conditions. The applicant shall submit all reports and information requested by the Board or the Department demonstrating that the applicant has complied or will comply with all terms and conditions of this permit. All preconstruction terms and conditions must be met before construction begins.
- D. Initiation of Activity Within Two Years. If construction or operation of the activity is not begun within two years, this permit shall lapse and the applicant shall reapply to the Board for a new permit. The applicant may not begin construction or operation of the activity until a new permit is granted. Reapplications for permits shall state the reasons why the activity was not begun within two years from the granting of the initial permit and the reasons why the applicant will be able to begin the activity within two years from the granting of a new permit, if so granted. Reapplications for permits may include information submitted in the initial application by reference.
- E. Reexamination After Five Years. If the approved activity is not completed within five years from the date of the granting of a permit, the Board may reexamine its permit approval and impose additional terms or conditions to respond to significant changes in circumstances which may have occurred during the five-year period.
- F. No Construction Equipment Below High Water. No construction equipment being used in the undertaking of an approved activity is allowed below the mean high water line.
- G. Permit Included In Contract Bids. A copy of this permit must be included in or attached to all contract bid specifications for the approved activity.
- H. Permit Shown To Contractor. Work done by a contractor pursuant to this permit shall not begin before the contractor has been shown by the applicant a copy of this permit.



STATE OF MAINE

Department of Environmental Protection

MAIN OFFICE: RAY BUILDING, HOSPITAL STREET, AUGUSTA
MAIL ADDRESS: State House Station 17, Augusta, 04333

JOSEPH E. BRENNAN
GOVERNOR

RIGHTS OF REVIEW AND APPEAL

HENRY E. WARREN
COMMISSIONER

Any person aggrieved by a decision by the Board of Environmental Protection ("Board") or the Commissioner of Environmental Protection ("Commissioner") has the following rights of review and appeal:

I. For any decision by the Board:

A. Reconsideration by the Board:

Within 30 days after the applicant receives a Board decision any person aggrieved by the decision may petition the Board, in writing, to secure reconsideration of the decision. If the Board decision was made without a public hearing, the aggrieved applicant may also make a request, in writing, for a hearing. The petition shall include, but need not be limited to, the findings, conclusions or conditions objected to or believed to be in error, the basis of the objections or challenge and the remedy sought and the nature of any new or additional evidence to be offered.

The Board shall, within 30 days after receiving such a petition and after appropriate notice, grant the petition in full or in part; dismiss the petition in full or in part; or order a public hearing to be held within 45 days.

B. Judicial appeal:

Any person aggrieved by a final Board decision is entitled to judicial review by filing a petition in Superior Court for Kennebec County or in Superior Court for the county where: (1) the aggrieved person resides or has his principal place of business; or (2) the activity or property which is the subject of the proceeding is located.

The petition for review shall be filed within 30 days after receipt of notice if taken by a party to the proceeding of which review is sought. Any other person aggrieved shall have 40 days from the date the decision was rendered to petition for review.

The petition for review shall be sent by certified mail, return receipt requested, to the Department, all parties to the proceeding, and the Attorney General.

II. For a decision by the Commissioner:

A. Where the Legislature has delegated authority to the Commissioner to act on certain applications: Within 30 days after the

REGIONAL OFFICES

• Portland •

• Bangor •

• Presque Isle •

applicant receives a Commissioner decision, relative to any Legislatively-delegated license or permit, any person aggrieved by the decision may appeal to the Board for a review of the Commissioner's decision. The notice of appeal shall include, but need not be limited to, the findings, conclusions or conditions objected to or believed to be in error, the basis of the objections or challenge, the remedy sought, and the nature of any new or additional evidence to be offered. The Board's review shall be limited to the matters at issue in the written appeal.

The Board shall, within 30 days after receiving such an appeal and after appropriate notice, affirm, affirm with conditions, reverse the decision of the Commissioner, or order a public hearing to be held within 45 days.

B. Where the Board has delegated authority to the Commissioner to act on other applications: Within 30 days after the applicant receives a Commissioner decision, relative to any Board-delegated license or permit, any person aggrieved by the decision may appeal to the Board for a review of the Commissioner's decision. The notice of appeal shall include, but need not be limited to, the findings, conclusions or conditions objected to or believed to be in error; the basis of the objections or challenge, the remedy sought and the nature of any new or additional evidence to be offered. The Board's review shall be limited to the matters at issue in the written appeal.

The Board shall, within 30 days after receiving such an appeal and after appropriate notice, either affirm, affirm with conditions, or reverse the decision of the Commissioner, or order a public hearing to be held within 45 days.

The Board reserves the right to review the Commissioner's decision on any Board-delegated application at the next regularly scheduled Board meeting after such action. If the Board takes no action at such meeting, the Commissioner's decision is final, subject to the preceeding two paragraphs.

PLEASE NOTE:

1. Because a person other than the applicant may file an appeal, commencing work on an approved project before the appeal or review period has expired entails a risk that the approval may be altered. Applicants should assess the likelihood and extent of such a risk before commencing work.

2. The filing of a petition for review or appeal does not operate as a stay of the final agency action.

3. Further information concerning review and appeal may be found in the Maine Administrative Procedure Act (5 MRSA Section 8001 et seq.) and Department of Environmental Protection statutes (38 MRSA Section 341 et seq.) and regulations.

4. You may contact the Department's Division of Public Assistance, 289-2343 if you have any question about the review and appeal procedures.

APPENDIX II

HOW TO MANAGE A SAND DUNE

By

Marcel Moreau

The most important part of dune management is to keep people off the dunes in the summer. Dune grass is extremely fragile when it comes to human feet and it is helpless against them unless someone speaks up for it. Put up signs to explain it's purpose. If property is rented, make sure the tenants know the function and fragility of the dunes. Keep paths to the beach as narrow as possible. Use a boardwalk to minimize the impact of feet. If the money and/or the energy are available, build an elevated walkway - this will allow the dune grass to grow underneath and prevent weak spots in the dune. Remember: Paths are two way streets; if you can get to the ocean, the ocean can get to you.

If a good portion of a dune is lost in a storm, don't panic. The dune will come back if left alone or it can be given a head start by replanting dune grass. Bulldozing sand to rebuild the dune has been a common practice, but it has disadvantages. Dune grass roots will penetrate only as deep as they need to go to find water. If a lot of sand is piled up artificially, the root system may not fully penetrate this sand and you will be left with a loose sand core in the dune which will be a weak spot. On the other hand, if grass is replanted without piling up sand there is some increased risk of grass being washed out by a high tide. Perhaps the best compromise is to pile all the seaweed and debris you can into the area where you plan to plant and cover this with a thin layer of sand. This will provide natural fertilizer as well as help elevate the grass a little more above sea level, and produce a dune fully stabilized by the dune grass root system.

Newly planted grass should be lightly fertilized spring and fall for the first two years. Established dunes should be infrequently fertilized, if at all. Fertilizer helps give the new grass a head start, but continued fertilization will result in production of more growth than sand can support and a dependence of the dune grass on continued fertilization, i.e. the grass will become addicted to fertilizer.

Dune grass basically needs a lot of nitrogen, some phosphorus and no potassium (salt spray provides this), so the best fertilizer to get would have a ratio of 30 parts nitrogen, 10 parts phosphorus and 0 parts potassium (commonly known as 30-10-0). Unfortunately, you can't buy this ratio, but it's not really important. 23-16-10 or 18-10-10 or even 10-10-10 will be nearly as effective. Buy granular fertilizer and sprinkle over the dunes. Do Not put fertilizer in the hole along with the plants when the grass is planted. This will tend to over stimulate the grass and promote a localized rather than an extended root system. The weather will have a great deal of influence on the effectiveness of the fertilizer. A heavy downpour will wash the fertilizer right through the sand and will minimize the effect. Strong winds may blow much of it away. The ideal is several days of fog or slow drizzle so that the nutrients percolate through the sand slowly and the dune grass roots have sufficient time to soak them up.

There is a tendency to consider dried seaweed on the beach 'dirty' and an 'eyesore'. Be that as it may, washed up seaweed is an important part of the beach system, as it fertilizes the beach and provides a source of nutrients which encourages dune grass as well as many other types of vegetation to grow. Any vegetation that will grow on a beach is helping to stabilize sand, and sand stabilization is an important beach management goal. If seaweed must be removed from the beach itself, please do not bring it to the dump! It is free, natural fertilizer on which dune grass has thrived for many thousands of years. Spread it carefully on the dunes and its slow decay will provide nutrients for the dune grass. Moreover, it will help to trap additional sand.

Dune grass can be transplanted from existing stands but this is a lot of extra work. Planting stock can be obtained commercially (Church's Greenhouse & Nursery, Old Shore Road, Emma R.D. #1, Cape May, N. J. 08204, is a potential source). The key to successful planting is proper timing (first two weeks in April) and sufficient depth (9 inches). Grass should be planted three plants to a hole (a pointed stick is all you need to dig the hole) and spaced in staggered rows 18 inches apart. Remember: the primary cause of planting failure is insufficient depth.

The dune grass' most critical need is to be left alone. On a crowded beach full of frolicking people, this can be a problem. Fortunately the herd instinct is still quite strong in the human race and people on the whole respond quite well to fences. Problems will remain because of lost balls and frisbees, the need for public bath-rooms (where else can you go?), and an occasional scarcity of firewood (snow fences make great kindling). Dunes can deal with these limited intrusions, but fencing deteriorates rapidly on a heavily used beach and for appearance as well as effectiveness, continual fence maintenance is essential.

While wooden snow fencing has been the traditional dune defender, much flimsier barriers will work on less populated beaches. If anything as solid a snow fence is used, it is important to remove the fencing in the fall and replace it in the spring for two reasons. First, dunes will only grow and prosper if sand is allowed to blow onto them, and snow fencing will effectively prevent this. Second, a major storm will most likely destroy the fencing, and this could be expensive. Note that it is only necessary to remove that fencing which stands between the dunes and the ocean. Fencing behind dunes (near houses) and along paths can and should be left standing so as not to let people get in the habit of walking across the dunes.

Other methods which can be very useful in encouraging people to stay out of dunes include wild rose bushes (they can be very thorny) and poison ivy. Poison Ivy apparently grows quite well in sand, and could be a very effective deterrent, but the problem is finding volunteers to transplant it.

For help with questions or problems related to dune grass, contact the Soil Conservation Service (Sanford Office: 324-7015)

Remember that the recently enacted sand dune protection legislation requires that a permit be obtained before any changes are made or work is done on sand dune areas. The purpose of this law is not to make life difficult but to help people avoid mistakes. The law carries a penalty of up to \$5,000, so for the benefit of everyone concerned, consult the Department of Environmental Protection before altering any sand dunes. Call toll free 1-800-452-1942 during normal business hours.

